

REMARKS/ARGUMENTS

Claims 13, 14, 16 and 19-29 are pending. By this Amendment, claims 13 and 19 are amended. Support for the amendments to claims 13 and 19 can be found, for example, in the present specification at page 8, line 27 to page 11, line 2, and in original claims 13 and 19. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Rejection Under 35 U.S.C. §112, Second Paragraph

The Office Action rejects claims 13, 14, 16 and 20-29 as indefinite under 35 U.S.C. §112, second paragraph. By this Amendment, claim 13 is amended to obviate the rejection. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejections Under 35 U.S.C. §103

A. Gislason and Ino

The Office Action rejects claims 13, 14, 16 and 20-29 under 35 U.S.C. §103(a) over U.S. Patent No. 6,914,033 to Gislason et al. ("Gislason") in view of U.S. Patent No. 5,268,346 to Ino et al. ("Ino"). Applicants respectfully traverse the rejection.

Claim 13 recites "[a] process for producing hydrogen, comprising: desulfurizing a hydrocarbon fuel by contacting the hydrocarbon fuel to an adsorbent comprising cerium oxide, primary particles of the cerium oxide having a mean crystallite size of 10 nm or less; and subsequently reforming the desulfurized fuel by bringing the desulfurized fuel into contact with a catalyst comprising at least one member selected from the group consisting of a partial-oxidation reforming catalyst, an autothermal reforming catalyst, and a steam reforming catalyst; wherein: neither hydrogen nor oxygen is added while desulfurizing the hydrocarbon fuel; and the cerium oxide is a cerium oxide that has been calcined at a

temperature of from 120 to 400 °C, the cerium oxide being selected from the group consisting of cerium oxide alone, a mixture of cerium oxide and zirconium oxide, a mixture of cerium oxide and an alumina and cerium oxide carrying at least one metal selected from the group consisting of silver, copper, nickel, iron and manganese" (emphasis added). Gislason and Ino do not disclose or suggest such a process.

As correctly pointed out in the Office Action, Gislason discloses, in Example III, calcining a cerium oxide composition at a temperature of 635° C. *See* Office Action, pages 2 to 3; Gislason, column 17, lines 26 to 42. Gislason further discloses that such calcining may be carried out at temperatures of up to 1500° F (816° C). *See* Gislason, column 10, lines 31 to 39. While it is necessary to pass through the temperature range of 120 to 400° C, as recited in claim 13, to reach the temperatures employed in Gislason, one of ordinary skill in the art would be able to differentiate between a product that has been calcined within the particular temperature range recited in claim 13, and a product that has been calcined at a higher temperature as in Gislason. To interpret the temperature range in claim 13 otherwise is to simply ignore the recited temperature feature.

There is nothing in Gislason that would have led a skilled artisan to calcine in a temperature range of 120 to 400° C, as recited in claim 13. Further, there is nothing in Gislason that would have suggested to a skilled artisan that improved results can be obtained using a cerium oxide calcined at a temperature of from 120 to 400° C in comparison to a cerium oxide calcined at a temperature of more than 400°C. For example, Table 4 of the present specification demonstrates that the catalyst (CeO₂ carrying Ag) in Example 11, which is calcined at 500°C (outside of the range recited in claim 13), provides inferior results (time at which DMS concentration exceeds 0.1) in comparison to the catalysts of Examples 12-16, which are calcined at temperatures falling within the scope of claim 13. *See, e.g.,* present specification, page 28, Table 4.

Gislason does not disclose or suggest employing a cerium oxide having a mean crystallite size of 10 nm or less. Further, Gislason does not recognize that employing a cerium oxide having a mean crystallite size of 10 nm or less provides improved results. Cerium oxides having a mean crystallite size of 10 nm or less appears to be obtained by calcining at a temperature of from 120 to 400° C. That is, Gislason does not disclose the mean crystallite size recited in claim 13 or a manner in which such crystallite size is obtained.

One of ordinary skill in the art would appreciate that a large amount of H₂ consumption results in improved desulfurizing properties. *See, e.g.,* present specification, page 12, line 27 to page 13, line 19. As is apparent from Table 1 of the present specification, cerium oxides having a mean crystallite size of 10 nm or less provide superior H₂ consumption in comparison with cerium oxides having a mean crystallite size of more than 10 nm. *See* present specification, page 25, Table 1.

This improvement over known absorbents is also apparent from a comparison of Example 2 and Comparative Example 1 of the present specification. In Comparative Example 1, a calcination temperature outside the scope recited in claim 13 is employed (800 °C). *See* present specification, page 23, lines 13 to 15. In Example 2, a calcination temperature inside the scope recited in claim 13 is employed. *See* present specification, page 21, lines 26 to 27. As a result of this difference, the cerium oxide in Comparative Example 1 has a crystallite size outside the scope recited in claim 13 and the cerium oxide in Example 2 has a crystallite size inside the scope recited in claim 13. *See* present specification, page 25, Table 1. Further, when the respective cerium oxides are used in desulfurization, the cerium oxide of Example 2 shows improved desulfurization properties in comparison to the cerium oxide of Comparative Example 1. *See* present specification, page 25, Table 2. The properties of the cerium oxide in claim 13 do not exist in the cerium oxides of Gislason because the cerium oxides are distinct.

Gislason does not disclose or suggest the calcining temperature recited in claim 13, the crystallite size recited in claim 13, or the desirable properties resulting therefrom.

Gislason does not disclose or suggest each and every feature of claim 13.

Ino does not remedy the deficiencies of Gislason. Ino, like Gislason, does not disclose or suggest the calcining temperature recited in claim 13, the crystallite size recited in claim 13, or the desirable properties resulting therefrom. Accordingly, the combination of Gislason and Ino does not disclose or suggest each and every feature of claim 13.

Claim 13 would not have been rendered obvious by Gislason and Ino. Claims 14, 16 and 20-29 depend from claim 13 and, thus, also would not have been rendered obvious by Gislason and Ino. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Ino and Gislason

The Office Action rejects claims 13, 14, 16 and 20-29 under 35 U.S.C. §103(a) over Ino in view of Gislason. Applicants respectfully traverse the rejection.

Claim 13 is set forth above. For the reasons discussed above, Ino and Gislason fail to disclose or suggest each and every feature of claim 13.

Claim 13 would not have been rendered obvious by Ino and Gislason. Claims 14, 16 and 20-29 depend from claim 13 and, thus, also would not have been rendered obvious by Ino and Gislason. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

C. Gislason, Ino and Shore

The Office Action rejects claim 19 under 35 U.S.C. §103(a) over Gislason in view of Ino and U.S. Patent No. 6,541,419 to Shore et al. ("Shore"). Applicants respectfully traverse the rejection.

Claim 19 recites "[a] fuel cell system, comprising: a desulfurizer; and a reforming apparatus; wherein: the desulfurizer comprises an adsorbent comprising cerium oxide having primary particles with a mean crystallite size of 10 nm or less, the desulfurizer being configured so that a hydrocarbon fuel can be contacted to the adsorbent; and the reforming apparatus comprises a catalyst comprising at least one member selected from the group consisting of a partial-oxidation reforming catalyst, an autothermal reforming catalyst, and a steam reforming catalyst, the reforming apparatus being configured so that a desulfurized fuel can be contacted to the catalyst; wherein: the system is configured so that neither hydrogen nor oxygen is added when desulfurization is performed; the cerium oxide is a cerium oxide that has been calcined at a temperature of from 120 to 400 °C; and the cerium oxide is selected from the group consisting of cerium oxide alone, a mixture of cerium oxide and zirconium oxide, a mixture of cerium oxide and an alumina and cerium oxide carrying at least one metal selected from the group consisting of silver, copper, nickel, iron and manganese" (emphasis added). Gislason, Ino and Shore fail to disclose or suggest such a system.

For the reasons discussed above, neither Gislason nor Ino discloses or suggests the calcining temperature recited in claim 19, the crystallite size recited in claim 13, or the desirable properties resulting therefrom. Shore does not remedy the deficiencies of Gislason and Ino. The Office Action relies on Shore for its disclosure of a fuel cell system. *See* December 26, 2007 Office Action, pages 2 to 3. However, Shore, like Gislason and Ino, fails to disclose or suggest the calcining temperature recited in claim 19, the crystallite size recited in claim 19, or the desirable properties resulting therefrom. Accordingly, even if the

references were combined as proposed in the Office Action, a fuel cell as recited in claim 19 would not be obtained.

Claim 19 is would not have been rendered obvious by Gislason, Ino and Shore. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

D. Ino, Gislason and Shore

The Office Action rejects claim 19 under 35 U.S.C. §103(a) over Gislason in view of Ino and U.S. Patent No. 6,541,419 to Shore et al. ("Shore"). Applicants respectfully traverse the rejection.

Claim 19 is set forth above. For the reasons discussed above, Ino, Gislason and Shore fail to disclose or suggest each and every feature of claim 19.

Claim 19 would not have been rendered obvious by Ino, Gislason and Shore. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

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Conclusion

For the foregoing reasons, Applicants submit that claims 13, 14, 16 and 19-29 are in condition for allowance. Prompt reconsideration and allowance are respectfully requested.

Respectfully submitted,

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